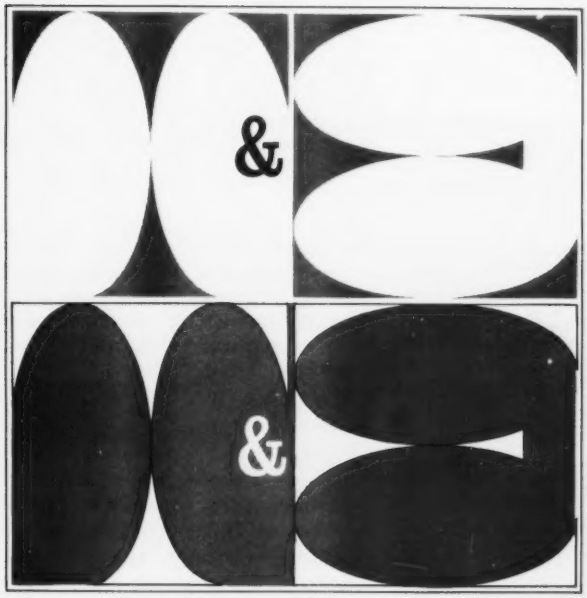
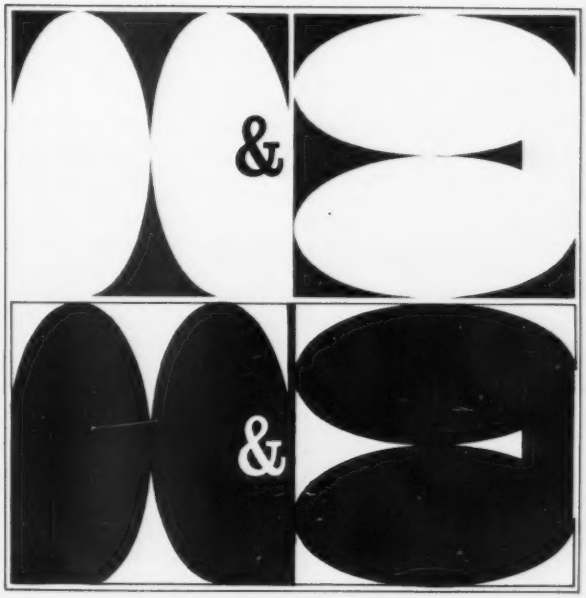
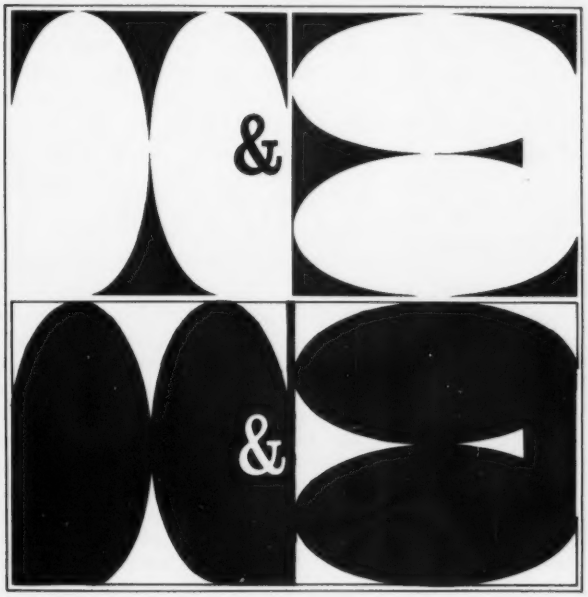
DOD TEST
&
EVALUATION

# COMMANDERS DIGEST

VOL. 14, NO. 24, DECEMBER 13, 1973







## New Test & Evaluation Policies Disclosed

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## FY 74 T & E Funding Requirements

– pg. 5

*New Organization*

# Test, Evaluation Policies

**By Lt. Gen. Alfred D. Starbird, USA (Ret.)**
**Deputy Director**
**(Test and Evaluation)**
**Office of the Director, Defense Research and Engineering**

In May 1970, the Deputy Secretary of Defense made sweeping changes in our approach in acquiring new systems. He delegated to the Services more responsibility but provided that, for "major acquisition programs," key decisions would be made by the Secretary of Defense. (These "major acquisition programs" are those of higher cost or otherwise specifically identified by the Secretary.) **Henceforth, concurrency between development and production would be minimized. There would be earliest hardware-proofing of risk-subsystems. Before a system moved into full scale production, it would be demonstrated in performance testing.**

In July 1970, the Blue Ribbon Defense Panel (BRDP) submitted its report. That report was quite critical of many of our practices in the acquiring of new systems. Test and evaluation was criticized. The BRDP identified three types of testing to be done on new systems. One essential type for all systems is the Development Test and its Evaluation (DT&E), which is that test conducted by the developer to prove that the system will meet technically its requirements. The other essential type is Operational Test and Evaluation (OT&E), which should be done by an organization independent of the developer and in a realistic environment to show the probable worth and suitability of the item when used in an operational situation. The BRDP also spoke of the need on occasion for another form of test and evaluation, —Joint Test and Evaluation (JT&E). This is testing where a new system is tried alongside of, or against, the capability of systems of another Military Service.

**Lt. Gen. Alfred D. Starbird**

Weaknesses that the BRDP recommended be remedied were in the areas of Operational Test and Evaluation, Joint Test and Evaluation, and in the supervision given by the Office of the Secretary of Defense to T&E. It found that past operational testing generally had been inadequate and, when done, too late to influence key decisions. It found that joint testing, when needed, was generally not done, and, in fact, that no effective arrangement existed in DoD for carrying out such joint test and evaluation. It reported that the most glaring deficiency was a lack of an Office Secretary of Defense (OSD) level organization responsible for overseeing T&E. It recommended an Assistant Secretary of Defense (T&E) responsible for policy, a Defense Test Agency, and separate budget category for OT&E.

During the first eight months of 1971, the Deputy Secretary of Defense directed by a series of memoranda changes he believed necessary to meet the BRDP intent. One instruction provided that for major acquisition programs, the Defense Systems Acquisition Review Council (DSARC) would consider at each key decision point whether adequate T&E had

## SECTION 506, PL 92-156, 17 Nov 1971

"Sec. 506. (a) Beginning with the calendar year 1972, the Secretary of Defense shall submit to the Congress each calendar year, at the same time the President submits the Budget . . . a written report regarding development and procurement schedules for each weapon system for which fund authorization is required . . . . [*] **Beginning with the calendar year 1973, there shall be included in the report data on operational testing and evaluation for each such weapon system for which funds for procurement are requested (other than funds requested only for the procurement of units for operational testing and evaluation and/or long lead-time items)** . . . .

"(b) A supplemental report shall be submitted to the Congress by the Secretary of Defense not less than thirty nor more than sixty days before the awarding of any contract or the exercising of any option in a contract for the procurement of any such weapon system (other than procurement of units for operational testing and evaluation and/or long lead-time items) . . . .

"(c) Any report required . . . shall include detailed and summarized information with respect to each weapon system covered by such report, and shall specifically include, but shall not be limited to— . . . .

"(3) . . . [*] **the results of all operational testing and evaluation up to the time of the submission of the report, or, if operational testing and evaluation has not been conducted, a statement of the reasons therefor and the results of such other testing and evaluation as has been conducted.**"

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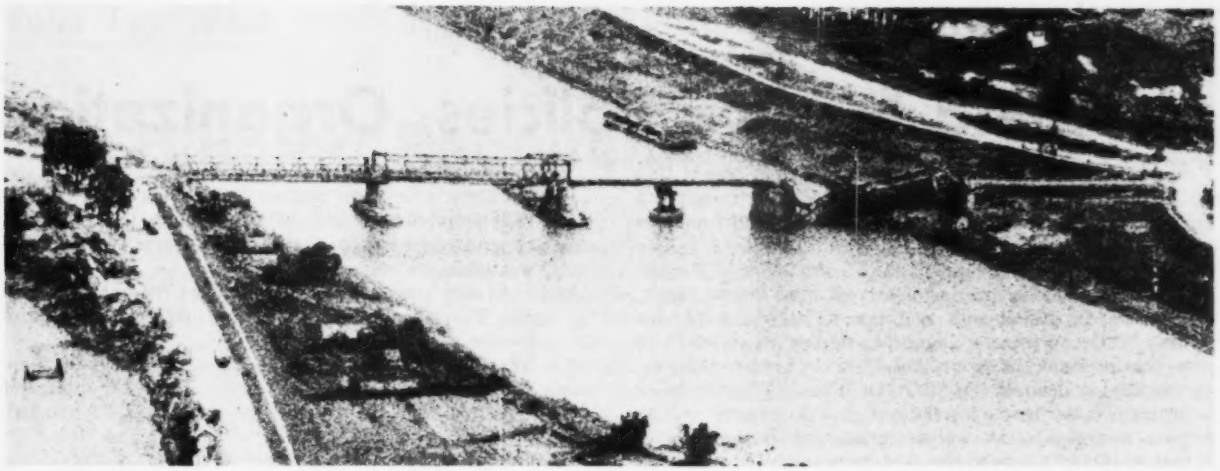

*U.S. Air Force Photo*

**The Canal de Rapides bridge in North Vietnam was destroyed by U.S. aircraft using terminally guided weapons.**

been accomplished. Another directive memorandum, in August 1971, formalized the responsibilities of my newly created office, the Office of the Deputy Director (Test and Evaluation) in the Office of Defense Research and Engineering. I was given across-the-board responsibility for the Office of the Secretary of Defense in test and evaluation matters. I was to:

- Recommend directly to the Secretary of Defense any changes in T&E policies and procedures I believed needed;
- Monitor closely all major acquisition programs, advising the DSARC and the Secretary of Defense directly at key decision points as to the adequacy of the accomplished and planned T&E,
- Initiate and coordinate accomplishment of such joint testing as is necessary; and
- Oversee for OSD its major ranges and test facilities.

In January 1973, the several earlier T&E memoranda were superseded by DOD Directive 5000.3 entitled "Test and Evaluation." It was in somewhat more detail and tightened to a degree the earlier memoranda instructions:

- It stated certain principles that should apply to *all acquisition programs*. T&E would start as early as possible and be conducted in phases so as to eliminate risks early. Acquisition schedules must be keyed to accomplishing T&E milestones before major added resource commitments were made. Prior to contracting for major production, there would be completed: sufficient development testing (DT&E) to insure that all design problems were identified and solutions were in hand; and sufficient operational testing (OT&E) to provide a valid estimate of operational effectiveness and suitability.
- In each Service, OT&E would be the responsibility of a field agency independent of the developing command. Typical military operating/maintaining personnel and units were to carry out the test,—not highly trained development technicians. Such operational testing was to be conducted in a simulated operational environment where the stresses of real combat operations (such as fatigue and countermeasures) were applied to the degree possible.
- Operational tests preferably were to be separate from development tests. However, an early phase of operational testing could be combined with a development test providing the combined test was participated in and accepted by both the developer and the independent operational test agency as satisfying their individual requirements. Pilot production items were to be used wherever possible for the development and operational testing completed before commitment to major production. However, final prototypes could be employed where these prototypes were truly like the expected production items.
- Under DoD Directive 5000.3, it was recognized that certain type systems would require special rules for their treatment. Ships were a case in point in that a ship normally requires several years for design, construction, and fitting out of a first ship. Special rules for ships were stated.
- The directive included an important new provision with respect to waiving satisfactory completion of required T&E. For each major acquisition program, the describing Development Concept Paper (DCP) sets forth such required T&E and only the Secretary of Defense can waive its accomplishment. For lesser programs, waiver can be granted only by the Secretary of the Military Department or his immediate subordinate designee—not delegated to lower levels.

Before describing what has been done to date, I should remind you of one last procedural matter. The Congress enacted in Public Law 92-156 of November 17, 1971 a Section 506. A partial quote of that Section is printed on page 2. Beginning with this budget submission, for each program for which procurement is requested, special reports on test results and plans are required.

## *Significant Accomplishment*

# Adapting to New Policies, Organization

By far the most significant accomplishment to date is that all in DoD engaged in systems acquisition now understand fully what is wanted in Test and Evaluation (T&E) and are attempting to provide it:

- In mid-Calendar Year (CY) 1971, the Military Departments designated commands independent of the developer, together with higher staff elements, to be responsible for their T&E and these are now functioning effectively.
- For all major programs, the Defense Systems Acquisition Review Council (DSARC) has become effective as an agent to insure that adequate test is accomplished and on time, and particularly initial Operational Test and Evaluation (OT&E) before the first production. I attend all DSARC meetings and there give my assessment and recommendation. After the meeting, my assessment of the T&E results to support the recommended decision goes to the Secretary of Defense. In the last two years, the DSARC has reviewed 49 programs. A major portion of the discussion in each meeting has concerned T&E.
- I have reviewed and worked with the Services in restructuring all 70 higher cost programs which are still in some stage of development. Substantially all the newer programs have been revised to meet in full the new requirements. Some of the older programs, however, could not be so adjusted without unacceptable cost impact. To be more specific:

  Forty-six of these 70 have been adjusted to be in full agreement with the new policy. In the majority of cases we were able to secure adequate reproduction by adding or advancing test phases, but, in 15 cases, it was necessary to retard earlier planned production schedules.

  Nine programs had advanced into their engineering development so far that all desirable preproduction T&E could not be secured, but for these nine major improvement has been made in adding or advancing T&E.

  Fifteen even older systems had advanced so far that their preproduction and early production T&E could not be greatly improved, but for most some improvement was made.

  As new major systems are initiated they are reviewed and T&E plans adjusted at their start to agree with present policies.

- The Military Departments have issued their initial more detailed T&E regulations. These outline both how the major programs and "less than major" programs will be handled. The principles are the same for the "major" and "less than major." The Military Departments themselves are reviewing the "less than major" programs and adjusting them to the new policy requirements.
- Also this year, we have completed and sent to the Congress the Section 506, PL 92-156, test data on some 97 programs. This data is included as a portion of the Services' Congressional data sheets.
- A real start has been made in accomplishing necessary joint testing. I shall cover this under my later discussion of funding requirements.
- Also, we are monitoring much more closely now our major T&E facilities to insure that they operate effectively and that unwarranted cost is eliminated. In late December 1971, Secretary of Defense identified 26 facilities (such as the Eastern Test Range at Patrick AFB, Florida), listed on *Chart 1* as comprising the "Major Elements of the DoD Test & Evaluation Facility Base." During this past year, we conducted a first annual, in-depth, overall budget review of these. Also, the Secretary of Defense directed a new funding policy to have users uniformly pay, beginning in Fiscal Year (FY) 75 the direct cost of the load they throw upon most of these facilities. These two moves will increase cross-Service use and lessen unnecessary duplication of capabilities.

*U.S. Air Force Photo*

**SURVIVABILITY—The A-7 Corsair II and F-4 Phantom are being tested for aircraft survivability. (See Item 8, Chart 2) The information gained through these tests will be used to modify aircraft design in the future and to establish better operational survivability factors for tactical planning.**

## *Joint Test Work*

# Funding Requirements for T & E

In Fiscal Year 73, Congress established a new appropriation under Title V for "Director of Test and Evaluation, Defense." As *Chart 2* indicates, $27 million (M) was appropriated under this appropriation in FY 73 and $24.6 M is requested in FY 74. In summary:

- $6.25 M in FY 73 is being used in a one-year effort to strengthen new Service and independent OT&E agencies work. No repeat of this funding is requested for FY 74.

- The remainder of the FY 73 funds ($20.75 M) and those requested for FY 74 ($24.6 M) are primarily for 11 specific joint test activities. Generally, completion of a joint test activity requires about three years: a first year for planning and contracting for any new instrumentation; a second for a check test and accomplishing preparation for the full-scale test; and a third for the full-scale test and its evaluation. For these joint test activities, the Services pay for the normal operating costs of the personnel and military units involved. This new appropriation is used to reimburse for added test-induced costs for work such as test planning, new instrumentation, data gathering, and the like.

The first of these tests was the Maverick Joint Test *(Item 1, Chart 2)*. In FY 72, a "pilot" 2-sided JT&E of the new Maverick air-to-ground missile was initiated to determine whether attack pilots could acquire maneuvering armored ground targets and make attacks without excessive loss to antiaircraft (AA). The Weapons Systems Evaluation Group (WSEG) developed test plans. My office procured portable instrumentation. The Air Force and Army organized a joint test force. WSEG monitored the test and upon completion made an independent evaluation of results. Over 1,300 F-4/Maverick attack passes were made under varied conditions of background, weather and sun-angles. The results were used to determine if Maverick production should continue. I might say that WSEG's role in this test is being repeated in most of the others I shall describe.

**Electronic Warfare (EW) Joint Test** *(Line 2, Chart 2)*. We know from Southeast Asia that the ability of aircraft to penetrate a surface-to-air missile (SAM) defended area is critically dependent upon aircraft EW capabilities. The U. S. has a few aircraft/EW systems in inventory and others in development. The EW joint test is to be a very extensive one to determine the best tactics and aircraft mix for penetration and the success of penetration. A small-scale check test is now being conducted and a full-scale test will be completed next fall. Various formations of aircraft will fly against ground complexes of surface-to-air missile (SAM) and AA radar simulators and the results measured. For FY 74, an estimated $1.2 M is needed to complete the active test phases.

**Hit Probability Joint Test** *(Item 3 Chart 2)*. Before Vietnam we expected

### MAJOR ELEMENTS OF THE DOD TEST & EVALUATION FACILITY BASE

**ARMY**

Arctic Test Center, Fort Greely, Alaska
Tropic Test Center, Fort Clayton, Canal Zone
Yuma Proving Ground, Yuma, Arizona
Jefferson Proving Ground, Madison, Indiana
White Sands Missile Range, White Sands, New Mexico
Kwajalein Missile Range, Huntsville, Alabama
Electronics Proving Ground, Fort Huachuca, Arizona
Dugway Proving Ground, Salt Lake City, Utah
Aberdeen Proving Ground, Aberdeen, Maryland

**NAVY**

Pacific Missile Range, Point Mugu, California
Atlantic Undersea T&E Center, Andros Island, Bahamas
Naval Air Test Center, Patuxent River, Maryland
Naval Air Propulsion Test Center, Trenton, New Jersey
Naval Air Test Facility, Lakehurst, New Jersey
Naval Aerospace Recovery Facility, El Centro, California
Naval Weapons Center, China Lake, California
Atlantic Fleet Weapons Range, Roosevelt Roads, Puerto Rico

**AIR FORCE**

Space & Missile Test Center, Vandenberg AFB, California
Eastern Test Range, Patrick AFB, Florida
Satellite Control Facility, Sunnyvale, California
Arnold Engineering Development Center, Tullahoma, Tennessee
Flight Test Center, Edwards AFB, California
Armament Development & Test Center, Eglin AFB, Florida
Air Defense Weapons Center, Tyndall AFB, Florida
Special Weapons Center, Kirtland AFB, New Mexico
Tactical Fighter Weapons Center, Nellis AFB, Nevada

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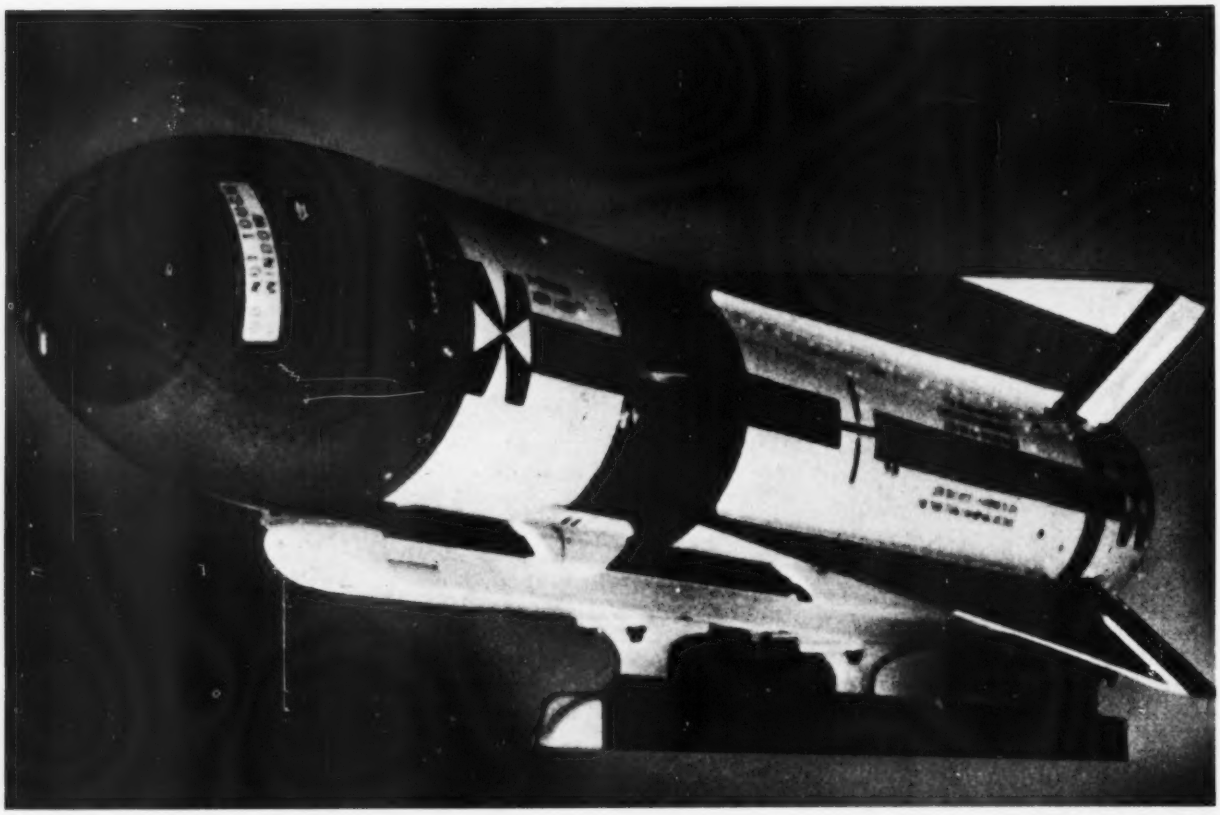
*Chart 1*



*U.S. Air Force Photo*

**The ZAGM-65 Maverick TV-guided air-to-ground missile was the first system in the T & E joint-test program.**

antiaircraft guns to have only limited effect against attacking aircraft. Yet we lost heavily to such guns in Southeast Asia (SEA). Various mathematical models are now used to estimate the probability of hit in different operational situations, but they are not proven by realistic measured test results. In order to obtain necessary realistic data in this joint test, we shall use the best representation available of modern U.S.S.R. guns, firing nonlethal ammunition against typical aircraft in various engagement situations and accurately measure results. The check test will be done this fall, and the full test early in CY 74, requiring an estimated $2 M in FY 74.

**Laser Guided Weapons Countermeasures Test** *(Item 4, Chart 2).* Laser guided weapons have shown they can give a great increase in effectiveness. We know, however, there are, theoretically, technical means of countermeasuring them but do not know how operationally practical this would be. To answer this question, laboratory and captive flight tests have been started and will be followed by more comprehensive operational field tests completing by the end of FY 75. An estimated $3.2 M is required in FY 74 to continue this joint test activity.

**Airborne Target Acquisition Test** *(Item 5, Chart 2).* We badly need better information on crew capabilities in various aircraft to acquire operational close air support targets—both visually unaided and with new electro-optical aids. Typical aircraft with and without these aids will be flown to accomplish target search, identification and maneuver for release. Initial simulation and test experiments will narrow variables needing test, and test of instrumentation has been initiated. Flight testing for the daylight clear-weather phase will start in spring 1975 and be completed in summer 1975. The estimated amount required for FY 74 is $2.15 M.


COMMANDERS DIGEST

**Vol. 14, No. 24, Dec. 13, 1973**

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**Air-to-Air Weapons Effectiveness Test** *(Item 6, Chart 2).* This test will secure realistic, operational, terminal-guidance information on our radar guided and our infrared homing air-to-air missiles (the AIM-7 and AIM-9 families). From this, we shall improve greatly the definition of tactical launch envelopes, and under what conditions they will have a high kill probability, and contribute to improved missile design in the future. Certain firing tests are scheduled to begin this fall and to be completed in late FY 74. The estimate of $2.2 M is needed in FY 74 to bring this test to near completion.

**Radar Bombing Accuracy Test** *(Item 7, Chart 2).* Most radar bombing accuracy tables are based on drops made in open ranges against uncluttered radar reflectors. Yet, when our forces in Southeast Asia attempted such missions, errors were normally much larger than expected. We have under procurement with FY 73 funds high-accuracy instrumentation that will permit us to realistically estimate impact points from simulated bomb drops. We shall use this to make radar bombing runs in realistic cluttered, cultural locations instead of having results based only on clear ranges. Check of the instrumentation will be made in early CY 74. Thereafter, detailed testing at various sites will be conducted using A-6s and F-111s, completing in early CY 75. An estimated $2.6 M is needed in FY 74 for this program.

**Aircraft Survivability Test** *(Item 8, Chart 2).* During the SEA conflict, we lost over 4,000 aircraft to enemy fire, and the exact cause of the loss usually could not be fully determined. Our objective in this test is to establish through firing into the critical aircraft subsystems how vulnerable are those subsystems for the A-7, F-4, and AH-1G. The information will be used to modify aircraft design in the future and to establish better operational survivability factors for tactical planning. Test firings for all three aircraft have begun with the last of the firings to be in early FY 75. $3.6 M is required to continue this activity in FY 74.

*U.S. Air Force Photo*

**A U.S. Air Force F-4E Phantom aircraft with eight containers of cluster bomb units (CBU) dives on its target.**

**Continental Operations Range** *(Item 9, Chart 2).* One of our great weaknesses at present is that our current ranges have not been structured to permit realistic multi-aircraft OT&E (and training). We have, therefore, accomplished with the Air Force planning, to prepare our existing land range and airspace reservations of the southwest into a realistic "continental operations range." Last year the Air Force and I testified concerning this need. Work on site was started in FY 73. Under this appropriation, $.477 M was used in FY 73 and in FY 74 an amount of $2.0 M is required. This appropriation will provide funds for scoping and engineering studies and for special instrumentation. The major portion of the work in FY 74 and all work thereafter will be from Air Force funding.

**Joint Test Activities to be Started in FY 74.** Two additional joint test activities will be started in FY 1974.

- **Close Air Support Command and Control** *(Item 10, Chart 2).* As an outgrowth of former Deputy Secretary of Defense David Packard's study on close air support, he directed operational testing to establish more accurately operational command and control capabilities. Joint Chiefs of Staff (JCS) were assigned the task with my office to review plans and data and provide financial support for any special requirements. A first major test in a series is expected to take place in a normal command exercise in spring 1974. $2.2 M is required under this appropriation in FY 74, primarily to cover special costs for planning and the new instrumentation.

- **Laser Guided Weapons in Close Air Support** *(Item 11, Chart 2).* A second is a test of laser guided weapons (LGWs) in close air support. Its objective is to identify the density of LGWs and command and control problems which may limit their use or cause undue interference. We expect to accomplish planning and initiate procurement of any special equipment and instrumentation in FY 74 and to start testing in FY 75. $2.8 M is requested to start this activity in FY 74.

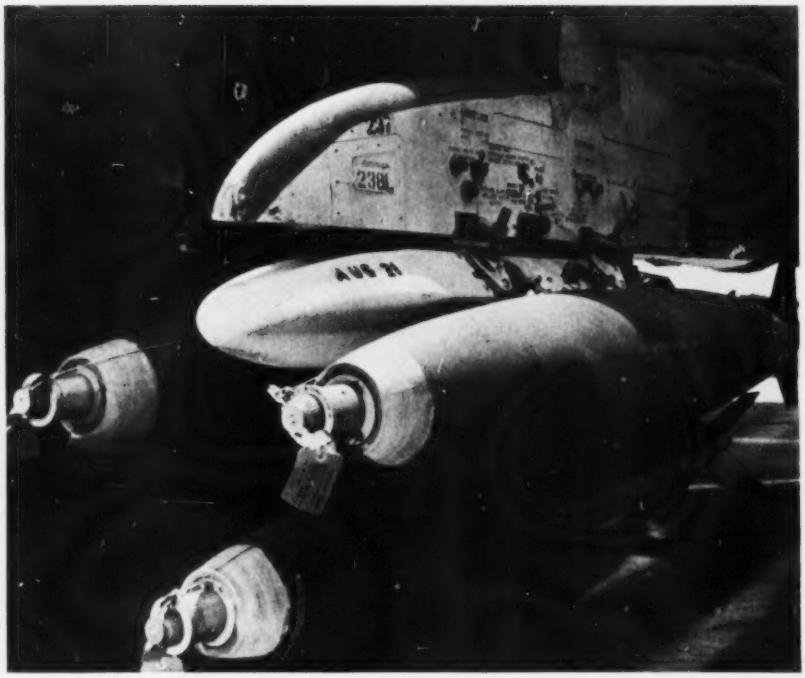
Finally, in this appropriation, I request $650,000 to accomplish feasibility studies on possible future joint tests and analyses of certain technical range and test facility problems that arise. An estimated $400,000 would be used on feasibility studies and $250,000 on range problems.

## ACTIVITIES FUNDED BY APPROPRIATION "DIRECTOR OF TEST AND EVALUATION, DEFENSE"

(in thousands of dollars)

| | FY 73 Appr | FY 74 Request |
|---|---|---|
| I. Improvement of OT&E Capability | 6,250 | — |
| II. Joint Test Activities | | |
| 1. Maverick Joint Test | 77 | — |
| 2. Electronic Warfare Joint Test | 4,226 | 1,200 |
| 3. Hit Probability Joint Test | 5,129 | 2,000 |
| 4. Laser Guided Weapon Countermeasure | 633 | 3,200 |
| 5. Airborne Target Acquisition Test | 1,808 | 2,150 |
| 6. Air-to-Air Weapon Effectiveness Test | 2,599 | 2,200 |
| 7. Radar Bombing Accuracy Test | 2,326 | 2,600 |
| 8. Aircraft Survivability Test | 3,096 | 3,600 |
| 9. Continental Operations Range Studies | 477 | 2,000 |
| 10. Close Air Support Command and Control Test | | 2,200 |
| 11. Laser Guided Weapons in Close Support Operation | | 2,800 |
| III. Other | 379 | 650 |
| TOTAL | 27,000 | 24,600 |

*Chart 2*



*U.S. Air Force Photo*

**A closeup of MK-84 bombs on the wing of a U.S. Air Force F-4 Phantom aircraft.**

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**Continental Operations Range** *(Item 9, Chart 2).* One of our great weaknesses at present is that our current ranges have not been structured to permit realistic multi-aircraft OT&E (and training). We have, therefore, accomplished with the Air Force planning, to prepare our existing land range and airspace reservations of the southwest into a realistic "continental operations range." Last year the Air Force and I testified concerning this need. Work on site was started in FY 73. Under this appropriation, $.477 M was used in FY 73 and in FY 74 an amount of $2.0 M is required. This appropriation will provide funds for scoping and engineering studies and for special instrumentation. The major portion of the work in FY 74 and all work thereafter will be from Air Force funding.

**Joint Test Activities to be Started in FY 74.** Two additional joint test activities will be started in FY 1974.

- **Close Air Support Command and Control** *(Item 10, Chart 2).* As an outgrowth of former Deputy Secretary of Defense David Packard's study on close air support, he directed operational testing to establish more accurately operational command and control capabilities. Joint Chiefs of Staff (JCS) were assigned the task with my office to review plans and data and provide financial support for any special requirements. A first major test in a series is expected to take place in a normal command exercise in spring 1974. $2.2 M is required under this appropriation in FY 74, primarily to cover special costs for planning and the new instrumentation.

- **Laser Guided Weapons in Close Air Support** *(Item 11, Chart 2).* A second is a test of laser guided weapons (LGWs) in close air support. Its objective is to identify the density of LGWs and command and control problems which may limit their use or cause undue interference. We expect to accomplish planning and initiate procurement of any special equipment and instrumentation in FY 74 and to start testing in FY 75. $2.8 M is requested to start this activity in FY 74.

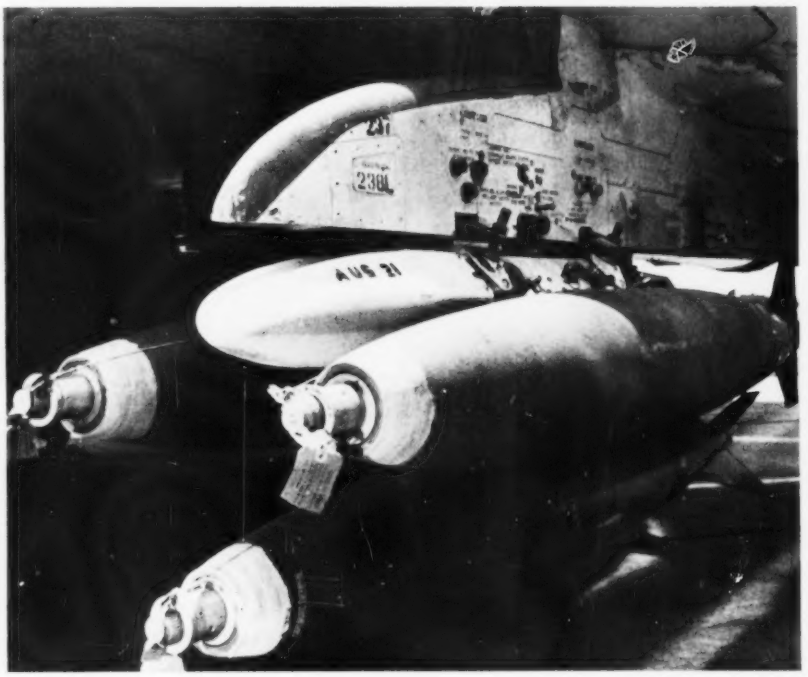
Finally, in this appropriation, I request $650,000 to accomplish feasibility studies on possible future joint tests and analyses of certain technical range and test facility problems that arise. An estimated $400,000 would be used on feasibility studies and $250,000 on range problems.

## ACTIVITIES FUNDED BY APPROPRIATION "DIRECTOR OF TEST AND EVALUATION, DEFENSE"

**(in thousands of dollars)**

| | FY 73 Appr | FY 74 Request |
|---|---|---|
| I. Improvement of OT&E Capability | 6,250 | — |
| II. Joint Test Activities | | |
| 1. Maverick Joint Test | 77 | — |
| 2. Electronic Warfare Joint Test | 4,226 | 1,200 |
| 3. Hit Probability Joint Test | 5,129 | 2,000 |
| 4. Laser Guided Weapon Countermeasure | 633 | 3,200 |
| 5. Airborne Target Acquisition Test | 1,808 | 2,150 |
| 6. Air-to-Air Weapon Effectiveness Test | 2,599 | 2,200 |
| 7. Radar Bombing Accuracy Test | 2,326 | 2,600 |
| 8. Aircraft Survivability Test | 3,096 | 3,600 |
| 9. Continental Operations Range Studies | 477 | 2,000 |
| 10. Close Air Support Command and Control Test | | 2,200 |
| 11. Laser Guided Weapons in Close Support Operation | | 2,800 |
| III. Other | 379 | 650 |
| TOTAL | 27,000 | 24,600 |

*Chart 2*



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